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DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Rejections over Yokokawa

1. **Claims 1, 4, 9-16, 18, 19, 35, 38, 40-43** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544). **As to Claim 1**, Yokokawa teaches a method of forming a thermoplastic elastomeric composition comprising:

- (a) heating a fluoroelastomer in the presence of a thermoplastic material and curing agent for a time less than that needed to completely cure the fluoroelastomer (4:50-68).
- (d) completely curing the thermoplastic vulcanizate (5:13-34).

Yokokawa is silent to:

- (a) heating to partially cure the thermoplastic vulcanizate.
- (b) applying an adhesive layer to a substrate
- (c) bringing the partially cured thermoplastic into contact with the adhesive layer.

However, these aspects of the invention would have been obvious for the following reasons:

(a) Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending. Additionally, Ozawa teaches that vulcanization conditions, particularly temperature and time, should be selected by the artisan (24:29-36).

(b) Ozawa teaches applying an adhesive (22:32) to the substrate (22:30-31).

(c) Yokokawa teaches a vulcanizate that would have partial degree of curing (See (a) above), and Ozawa teaches that it is known to apply a thermoplastic elastomer composition to the adhesive layer (22:30-36). In the combination, one would have found it obvious to use the process of Yokokawa to fabricate the outer layer to be placed on the adhesive and substrate of Ozawa.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Ozawa into that of Yokokawa for the following reasons:

(a) It would be desirable to the method of Yokokawa to integrate the thermoplastic-fluoroelastomer material with other objects, such as the materials of Ozawa, in order to provide strength, shape, or other properties of the secondary material(s), and to improve the bond with those materials.

(b) Yokokawa suggests fabricating tubular articles (5:62), which is the shape provided by Ozawa (Col. 22).

(c) The teachings of Ozawa regarding the selection of appropriate temperature and time for dynamic vulcanization would have been desirable to one seeking to optimize the process of Yokokawa and provide an appropriate degree of mixing and/or curing.

As to Claim 4, Ozawa teaches that the substrate may comprise reinforcing fibers (21:65-22:3) such as polyamides, nylons, and polyesters, which are plastics. **As to Claim 9**, Yokokawa teaches peroxide catalysts (4:41).

As to Claim 10, Yokokawa teaches injection molding or extruding a thermoplastic elastomer composition (5:15-19), wherein the thermoplastic composition would comprises a discrete phase of fluoroelastomer and a continuous phase of thermoplastic polymer material (2:49-68, 300 parts polyvinylidene fluoride and 100 parts elastomer would lead to the continuous thermoplastic and discrete fluoroelastomer phases), and curing the thermoplastic elastomer composition (5:20-40).

Yokokawa is silent to:

- (a) applying a partially cured thermoplastic elastomer composition.
- (b) applying the thermoplastic elastomer onto a substrate

However, these aspects of the invention would have been obvious for the following reasons:

- (a) Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at

160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending. Additionally, Ozawa teaches that vulcanization conditions, particularly temperature and time, should be selected by the artisan (24:29-36).

(b) Ozawa teaches applying a thermoplastic material (22:32) onto the substrate (22:33-36).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Ozawa into that of Yokokawa for the following reasons:

- (a) It would be desirable to the method of Yokokawa to integrate the thermoplastic-fluoroelastomer material with other objects, such as the materials of Ozawa, in order to provide strength, shape, or other properties of the secondary material(s).
- (b) Yokokawa suggests fabricating tubular articles (5:62), which is the shape provided by Ozawa (Col. 22).
- (c) The teachings of Ozawa regarding the selection of appropriate temperature and time for dynamic vulcanization would have been desirable to one seeking to optimize the process of Yokokawa and provide an appropriate degree of mixing and/or curing.

As to Claim 11, the vulcanizate of Yokokawa would implicitly comprise a partially cured dynamic vulcanizate (See Claim 10 above) of a fluoroelastomer (2:25-32) and a thermoplastic material (2:33). **As to Claim 12**, Yokokawa teaches copolymers of vinylidene fluoride (2:27-30). **As to Claim 13**, Yokokawa teaches mixing by a process of mixing the

fluoroelastomer and thermoplastic and curing agent while heating (4:50-52), which would implicitly effect a partial curing of the fluoroelastomer. **As to Claims 14-16**, Ozawa teaches that in a dynamic mixing process, many thermoplastics may be used interchangeably, including fluoroplastics (23:47-49, ETFE), non-fluorinated (23:20-43), and partially fluorinated thermoplastics (PVDF, 23:44-45). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate these materials into the method of Yokokawa because (a) these materials are interchangeable with the material of Yokokawa, and (b) each of these materials would provide different mechanical properties and melt temperatures which would be more desirable for particular applications which require those properties. **As to Claim 18**, Yokokawa teaches peroxide catalysts (4:41). **As to Claim 19**, Ozawa teaches that when interating materials, it may be desirable to apply an adhesive to the solid support and apply the thermoplastic-elastomer composition onto the adhesive (22:27-36). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the adhesive and substrate into the method of Yokokawa in order to provide strength and adherence between the materials.

As to Claim 35, note that step (b) of this claim recites "into said second port said first port;" which is a typographical error. By the exclusion of the curing agent from step (a), the curing agent is interpreted to be placed into the second port in step (b). Yokokawa teaches a method for forming a thermoplastic fluorocarbon elastomer composition comprising first mixing a mixture of fluorocarbon elastomer and thermoplastic material (4:8-16), then feeding a curing agent for the fluorocarbon elastomer into the mixture (4:16-18), which would inherently have a "T90" (time to 90% cure). Yokokawa further teaches injection molding or extrusion (5:15-19),

and completing the cure of the thermoplastic vulcanizate (5:20-39). Yokokawa does not specifically teach adhering to a substrate, the twin screw extruder having ports or the steps of placing materials into ports, partial curing of the thermoplastic vulcanizate to less than its T90 time, or applying the material onto a substrate.

However, these aspects of the invention would have been *prima facie* obvious of Yokokawa or Ozawa for the following reasons:

Ozawa teaches that it is known to provide a twin screw extruder (36:28), feeding an elastomer and thermoplastic material into the extruder to mix the two materials and create a dispersion (36:28-34), mixing in a curing agent through a separate port (36:34-37), and applying the mixture onto a substrate (22:20-54).

Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Ozawa into that of Yokokawa for the following reasons:

- (a) It would be desirable to the method of Yokokawa to integrate the thermoplastic-fluoroelastomer material with other objects, such as the materials of Ozawa, in order to provide strength, shape, or other properties of the secondary material(s).
- (b) Yokokawa suggests fabricating tubular articles (5:62), which is the shape provided by Ozawa (Col. 22).
- (c) The teachings of Ozawa regarding the selection of appropriate temperature and time for dynamic vulcanization would have been desirable to one seeking to optimize the process of Yokokawa and provide an appropriate degree of mixing and/or curing
- (d) Ozawa teaches that the twin screw extruder is a desirable substitute for the Banbury mixer of Yokokawa (Ozawa, 17:10-15).

As to **Claims 38 and 40**, Yokokawa teaches copolymers of vinylidene fluoride and a peroxide curing agent (2:25-35, 4:41). As to **Claims 41-43**, Ozawa teaches that in a dynamic mixing process, many thermoplastics may be used interchangeably, including fluoroplastics (23:47-49, ETFE), non-fluorinated (23:20-43), and partially fluorinated thermoplastics (PVDF, 23:44-45). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate these materials into the method of Yokokawa because (a) these materials are interchangeable with the material of Yokokawa, and (b) each of these materials would provide different mechanical properties and melt temperatures which would be more desirable for particular applications which require those properties.

2. **Claims 2 and 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of Eisinga

(USPN 5792348). Yokokawa and Ozawa teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claims 2 and 3**, Yokokawa explicitly suggests injection molding (5:15-16), but Yokokawa is silent to “insertion molding” onto a metal substrate. However, Eisinga teaches that it is known to insert mold onto a steel plate (2:8-17), which is a metal insert placed in a mold, reading on “insertion molding”. It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Eisinga into that of Yokokawa because (a) Yokokawa provides injection molding of materials including polyvinylidene fluoride and Eisinga suggests that polyvinylidene fluoride is a suitable material for injection molding onto steel plates (6:17-19), and (b) it would be desirable in the method of Yokokawa to provide insert materials having strength or other properties not found in the thermoplastic material.

3. **Claims 5-7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of DeAntonis (EP 0132583 A2). Yokokawa and Ozawa teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claims 5-7**, Yokokawa explicitly suggests extrusion (5:16) of a mixture that is interpreted to be at least partially cured, but Yokokawa does not specifically teach “co-extrusion” of the adhesive and the partially cured thermoplastic vulcanizate by a liquid continuous injection unit. However, DeAntonis teaches applying and bringing layers together by co-extrusion of a plastic material, adhesive, and substrate (page 4). Although the device is not specifically described as a “liquid continuous injection unit”, it is submitted that because the layers are “molten” (page 4, line 31) and may be cast onto rolls (page 15, line 35), that the device of

DeAntonis is a liquid continuous injection unit. It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of DeAntonis into that of Yokokawa because (a) Yokokawa explicitly suggest extrusion (5:16) of polyvinylidene fluoride (6:45), which is provided by DeAntonis, and (b) incorporating the substrate of DeAntonis would maintain the excellent chemical resistance of the fluoropolymer but allow minimization of the amount of fluoropolymer used by providing only a surface layer (page 3, top half).

4. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of Kolb (USPN 3884877). Yokokawa and Ozawa teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 8**, Yokokawa is silent to the bisphenol curing agents. However, Kolb teaches that when curing fluoroelastomers (title) of vinylidene fluoride (4:55-56), it is known to use a bisphenol curative (8:63-69, 8:37-50). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Kolb into that of Yokokawa because (a) Yokokawa teaches vinylidene fluorides which require a catalyst or curing agent, and Kolb teaches that bisphenols are very useful (8:69) for curing fluoroelastomer compositions (title), particularly vinylidene fluoride (4:55-56), or (b) doing so would provide the ability to vary the curing time and temperature (9:22-25).

5. **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of Kolb (USPN

3884877). Yokokawa and Ozawa teach the subject matter of Claim 13 above under 35 USC 103(a). **As to Claim 17**, Yokokawa is silent to the bisphenol curing agents. However, Kolb teaches that when curing fluoroelastomers (title) of vinylidene fluoride (4:55-56), it is known to use a bisphenol curative (8:63-69, 8:37-50). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Kolb into that of Yokokawa because (a) Yokokawa teaches vinylidene fluorides which require a catalyst or curing agent, and Kolb teaches that bisphenols are very useful (8:69) for curing fluoroelastomer compositions (title), particularly vinylidene fluoride (4:55-56), or (b) doing so would provide the ability to vary the curing time and temperature (9:22-25).

6. **Claim 20** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of Eisinga (USPN 5792348). Yokokawa and Ozawa teach the subject matter of Claim 10 above under 35 USC 103(a). **As to Claim 20**, Yokokawa explicitly suggests injection molding (5:15-16) and curing (Col. 5), but Yokokawa is silent to "insertion molding" onto a substrate. However, Eisinga teaches that it is known to insert mold onto a steel plate (2:8-17), which is a metal insert placed in a mold, reading on "insertion molding". It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Eisinga into that of Yokokawa because (a) Yokokawa provides injection molding of materials including polyvinylidene fluoride and Eisinga suggests that polyvinylidene fluoride is a suitable material for injection molding onto steel plates (6:17-19), and (b) it would be desirable in the method of

Yokokawa to provide insert materials having strength or other properties not found in the thermoplastic material.

7. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of DeAntonis (EP 0132583 A2). Yokokawa and Ozawa teach the subject matter of Claim 10 above under 35 USC 103(a). **As to Claims 5-7**, Yokokawa explicitly suggests extrusion (5:16) of a mixture that is interpreted to be at least partially cured, but Yokokawa does not specifically teach “co-extrusion” of the substrate and composition. However, DeAntonis teaches applying and bringing layers together by co-extrusion of a thermoplastic material and substrate (page 4). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of DeAntonis into that of Yokokawa because (a) Yokokawa explicitly suggest extrusion (5:16) of polyvinylidene fluoride (6:45), which is provided by DeAntonis, and (b) incorporating the substrate of DeAntonis would maintain the excellent chemical resistance of the fluoropolymer but allow minimization of the amount of fluoropolymer used by providing only a surface layer (page 3, top half).

8. **Claims 22-26, 28** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of DeAntonis (EP 0132583 A2). **As to Claim 22**, Yokokawa teaches a method of making an article comprising:
(a) making a dynamic vulcanizate having a fluoroelastomer discrete phase and a thermoplastic continuous phase (which is implicit in view of the 3:1 weight ratio disclosed at 2:49-55);

(b) extruding (5:16);

(c) completing the cure of the extruded vulcanizate (5:20-38).

Yokoyama is silent to:

(a) the partially cured material

(b) co-extruding with a substrate

However, these aspects of the invention would have been prima facie obvious for the following reasons:

(a) Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending.

(b) DeAntonis teaches applying a thermoplastic material onto a substrate by co-extrusion (page 4).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of DeAntonis into that of Yokokawa because (a) Yokokawa explicitly suggest extrusion (5:16) of polyvinylidene fluoride (6:45), which is provided by DeAntonis, and (b) incorporating the substrate of DeAntonis would maintain the excellent chemical resistance of the fluoropolymer but allow minimization of the amount of fluoropolymer used by providing only a surface layer (page 3, top half).

As to **Claim 23**, DeAntonis provides a co-extruded adhesive layer between the two materials (page 4), and one would be motivated to incorporate the adhesive in order to improve the bond between the materials. As to **Claim 24**, DeAntonis teaches a multimanifold dies (page 4, line 22) which would inject the molten material in a liquid phase. As to **Claim 25**, Yokokawa teaches mixing together a fluoroelastomer resin, thermoplastic, and a curing agent at elevated temperature (4:44-60), and it is the Examiner's position that some degree of reaction would be implicit because substantially similar temperatures are also used for curing (7:9, 8:12-17). However, Yokokawa teaches that the degree of cure is not complete because doing so would disturb the mixing process (2:54-57). As to **Claim 26**, Yokokawa teaches at least vinylidene fluoride (2:25-35) which would be in an uncured copolymer form. As to **Claim 28**, Yokokawa teaches peroxides (4:41).

9. **Claim 27** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of DeAntonis (EP 0132583 A2), and further in view of Kolb (USPN 3884877). Yokokawa and DeAntonis teach the subject matter of Claim 25 above under 35 USC 103(a). As to **Claim 27**, Yokokawa is silent to the bisphenol curing agents. However, Kolb teaches that when curing fluoroelastomers (title) of vinylidene fluoride (4:55-56), it is known to use a bisphenol curative (8:63-69, 8:37-50). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Kolb into that of Yokokawa because (a) Yokokawa teaches vinylidene fluorides which require a catalyst or curing agent, and Kolb teaches that bisphenols are very useful (8:69) for curing fluoroelastomer

compositions (title), particularly vinylidene fluoride (4:55-56), or (b) doing so would provide the ability to vary the curing time and temperature (9:22-25).

10. **Claims 29-32, 34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Eisinga (USPN 5792348) and Ozawa (USPN 5910544).

As to **Claim 29**, Yokokawa teaches a method for making an article comprising a cured fluoroelastomer composition comprising injection molding and completing the cure of the elastomer composition (4:36-5:38), which would implicitly produce a discrete elastomer phase and substantially continuous fluorinated thermoplastic phase by the 1:3 weight ratio in which these components are included in the mixture (2:49-55). Yokokawa is silent to:

- (a) the solid metal substrate and applying an adhesive layer to the substrate
- (b) placing the adhesive covered substrate into the mold
- (c) insertion molding a partially cured elastomer to contact the substrate

However, these aspects of the invention would have been prima facie obvious for the following reasons:

(a,b) Eisinga teaches that it is known to provide a solid metal substrate (disclosed as a steel plate, 2:47-63, which would be “solid” even though it may have holes for various purposes) and place the substrate in a mold (2:8-17). Ozawa further teaches that it is known to provide an adhesive on the surface of articles that are to be coated (22:28-36).

(c) Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa’s teaching of curing cycles which include curing steps performed at

160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending. Eisinga further teaches injection molding onto an insert (2:12-17), which is interpreted to be insertion molding.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Eisinga and Ozawa into that of Yokokawa because it would be desirable to the method of Yokokawa to integrate the thermoplastic-fluoroelastomer material with other objects, such as the materials of Eisinga, in order to provide strength, shape, or other properties of the secondary material(s), and to improve the bond with those materials with an adhesive, according to the method of Ozawa.

As to Claim 30, Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending (2:54-58). Thus, the conditions provided by Yokokawa would fall within the claimed range which provides some degree of curing, but less than 90% cured elastomer. **As to Claim 31**, Yokokawa teaches a variety of mixing apparatuses, but is silent to the twin screw type. However, Ozawa teaches that the twin screw type of is particularly preferable for dynamic vulcanization (17:10-15), and one

would have been motivated to use this extruder in view of Ozawa's teaching that it is particularly preferred as an alternative to the Banbury mixer (17:10-15), such as also disclosed by Yokokawa (3:30). **As to Claims 32 and 34**, Yokokawa teaches a fluoroelastomer of vinylidene fluoride mixed with a peroxide (2:25-45 and 4:6-50).

11. **Claim 33** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Eisinga (USPN 5792348) and Ozawa (USPN 5910544), and further in view of Kolb (USPN 3884877). Yokokawa, Eisinga, and Ozawa teach the subject matter of Claim 30 above under 35 USC 103(a). **As to Claim 33**, Yokokawa is silent to the bisphenol curing agents. However, Kolb teaches that when curing fluoroelastomers (title) of vinylidene fluoride (4:55-56), it is known to use a bisphenol curative (8:63-69, 8:37-50). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Kolb into that of Yokokawa because (a) Yokokawa teaches vinylidene fluorides which require a catalyst or curing agent, and Kolb teaches that bisphenols are very useful (8:69) for curing fluoroelastomer compositions (title), particularly vinylidene fluoride (4:55-56), or (b) doing so would provide the ability to vary the curing time and temperature (9:22-25).

12. **Claim 36** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of Eisinga (USPN 5792348). Yokokawa and Ozawa teach the subject matter of Claim 35 above under 35 USC 103(a). **As to Claim 36**, Yokokawa teaches a method for making an article comprising a cured

fluoroelastomer composition comprising injection molding a mixture that would be partially cured due to its elevated mixing temperature (4:50-52) and completing the cure of the elastomer composition (4:36-5:38). Yokokawa is silent to the insertion molding process including a mold. However, Eisinga teaches that it is known to insert mold onto a steel plate (2:8-17). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Eisinga into that of Yokokawa because (a) Yokokawa provides injection molding of materials including polyvinylidene fluoride and Eisinga suggests that polyvinylidene fluoride is a suitable material for insertion molding onto steel plates (6:17-19), and (b) it would be desirable in the method of Yokokawa to provide insert materials having strength or other properties not found in the thermoplastic material.

13. **Claim 37** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of DeAntonis (EP 0132583 A2). Yokokawa and Ozawa teach the subject matter of Claim 35 above under 35 USC 103(a). **As to Claim 37**, Yokokawa explicitly suggests extrusion (5:16) of a mixture that is interpreted to be at least partially cured, but Yokokawa does not specifically teach “co-extrusion” of the vulcanizate and substrate. However, DeAntonis teaches applying and bringing layers together by co-extrusion of a plastic material, adhesive, and substrate (page 4). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of DeAntonis into that of Yokokawa because (a) Yokokawa explicitly suggest extrusion (5:16) of polyvinylidene fluoride (6:45), which is provided by DeAntonis, and (b) incorporating the substrate of DeAntonis would maintain the excellent chemical resistance of

the fluoropolymer but allow minimization of the amount of fluoropolymer used by providing only a surface layer (page 3, top half).

14. **Claim 39** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokokawa (USPN 4094949) in view of Ozawa (USPN 5910544), and further in view of Kolb (USPN 3884877). Yokokawa and Ozawa teach the subject matter of Claim 35 above under 35 USC 103(a). **As to Claim 39**, Yokokawa is silent to the bisphenol curing agents. However, Kolb teaches that when curing fluoroelastomers (title) of vinylidene fluoride (4:55-56), it is known to use a bisphenol curative (8:63-69, 8:37-50). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Kolb into that of Yokokawa because (a) Yokokawa teaches vinylidene fluorides which require a catalyst or curing agent, and Kolb teaches that bisphenols are very useful (8:69) for curing fluoroelastomer compositions (title), particularly vinylidene fluoride (4:55-56), or (b) doing so would provide the ability to vary the curing time and temperature (9:22-25).

Rejections over Takeyama

15. **Claims 1, 10, 35** are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeyama (USPN 6079465) in view of Yokokawa (USPN 4094949) and Ozawa (USPN 5910511). **As to Claims 1, 10, 35**, Takeyama teaches a method of forming a thermoplastic elastomer comprising heating a fluoroelastomer (7:1-15) in the presence of a thermoplastic material (5:50-6:15) and curing agent (10:5-35) to provide a discrete fluoroelastomer phase (7:1-15) in a continuous thermoplastic phase (5:50-6:15), applying adhesive (15:60-65), bringing the

vulcanizate into contact with the adhesive and completely curing the thermoplastic vulcanizate (20:20). Takeyama does not appear to teach heating to achieve a partial cure.

However, Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending. Additionally, Ozawa teaches that vulcanization conditions, particularly temperature and time, should be selected by the artisan (24:29-36), and therefore represent result-effective variables that the ordinary artisan would optimize.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Yokokawa and Ozawa into that of Takeyama because Takeyama suggests dynamic mixing and subsequent vulcanization, and Yokokawa and Ozawa provides a process of dynamic mixing to achieve these goals.

16. **Claim 22** is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeyama (USPN 6079465) in view of Yokokawa (USPN 4094949), Ozawa (USPN 5910511), and DeAntonis (EP 0132583 A2). **As to Claim 22**, Takeyama teaches a method of forming a thermoplastic elastomer comprising heating a fluoroelastomer (7:1-15) in the presence of a thermoplastic material (5:50-6:15) and curing agent (10:5-35) to provide a discrete

fluoroelastomer phase (7:1-15) in a continuous thermoplastic phase (5:50-6:15), applying adhesive (15:60-65), bringing the vulcanizate into contact with the adhesive and completely curing the thermoplastic vulcanizate (20:20). Takeyama does not specifically teach partial curing of the elastomer or co-extruding the partially cured material with a substrate.

However, Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending. Additionally, Ozawa teaches that vulcanization conditions, particularly temperature and time, should be selected by the artisan (24:29-36), and therefore represent result-effective variables that the ordinary artisan would optimize.

DeAntonis teaches applying a thermoplastic material onto a substrate by co-extrusion (page 4).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Yokokawa, Ozawa, and DeAntonis into that of Takeyama because Takeyama suggests dynamic mixing, formation of sheets, and subsequent vulcanization, and Yokokawa and Ozawa provides a process of dynamic mixing to achieve these goals, and DeAntonis provides teaching to form sheets.

17. **Claims 29** is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeyama (USPN 6079465), Yokokawa (USPN 4094949), Ozawa (USPN 5910544), and Maynard (USPN 2476884). **As to Claim 29**, Takeyama teaches a method of forming a thermoplastic elastomer comprising heating an elastomer (7:1-15) in the presence of a thermoplastic material (5:50-6:15) and curing agent (10:5-35) to provide a discrete fluoroelastomer phase (7:1-15) in a continuous thermoplastic phase (5:50-6:15), applying adhesive (15:60-65), bringing the vulcanizate into contact with the adhesive and completely curing the thermoplastic vulcanizate (20:20). Takeyama does not specifically teach partial curing of the elastomer or placing a substrate and adhesive in a mold.

However, Yokokawa teaches dynamically mixing while heating to temperatures of 120 C (4:51), which would have resulted in some partial curing of the vulcanizate material. This position is supported by Yokokawa's teaching of curing cycles which include curing steps performed at 160 C (7:9) or 100 to 125 C (8:13-14). Yokokawa's teaching of curing cycles which include temperatures similar to those also used in the mixing step suggests that some degree of vulcanization occurred. However, Yokokawa suggests that the vulcanization should not proceed to completion because doing so would affect blending. Additionally, Ozawa teaches that vulcanization conditions, particularly temperature and time, should be selected by the artisan (24:29-36), and therefore represent result-effective variables that the ordinary artisan would optimize.

Maynard teaches placing a substrate in a mold and injection (insertion molding a composition to contact the substrate (Fig. 1). Ozawa and Takeyama each teach an adhesive.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Yokokawa, Ozawa, and Maynard into that of Takeyama because Takeyama suggests dynamic mixing, formation of tires, and subsequent vulcanization, and Yokokawa and Ozawa provides a process of dynamic mixing to achieve these goals, and Maynard provides a method for making tires including subsequent vulcanization.

Response to Arguments

18. Applicant's arguments filed 30 August 2007 have been fully considered but they are not persuasive. The arguments appear to be on the following grounds:

- a) Ozawa teaches away from vulcanization.
- b) DeAntonis discloses methods of coextruding various fluorine containing and non-fluorine thermoplastic polymers with adhesives between them. There is no motivation to carry out a post extrusion cure because every layer is thermoplastic.
- c) Yokokawa does not disclose completing the cure "while in contact with the substrate". Eisinga teaches away from a cure completion step because it teaches a thermoplastic synthetic resin.

19. These arguments are not persuasive for the following reasons:

- a) In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Additionally, note that in some

embodiments, Ozawa provides "heat treatment" on the article after placing the various layers together (18:20-24, for example) such that the reference, as a whole, cannot be said to teach away from a step of crosslinking or vulcanization. Moreover, doing so overlooks the teaching of Yokokawa.

Also see the new rejections above.

b) In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In arguing that DeAntonis teaches only thermoplastics, Applicants appear do not appear to consider the combination leading to the rejection.

c) Yokokawa suggests or teaches that curing is performed after removal from the mixer. In any process where the material is subsequently assembled into an article, it would have been obvious to vulcanize after assembly in order that the cured mixture might retain its assembled shape.

Conclusion

Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 2 November 2007 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MSD
11/30/07


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